

Segment 3

Jacob is beginning to feel the effects of his quarantine. His sleep has been disturbed and his eating habits are not the best. All these things are starting to take a toll on Jacob, but he insists that quarantine is the best way to stay healthy. The tree house detectives decide that they need to learn more about the immune system so they visit an immunologist, Dr. Zilliox in Norfolk, Virginia. She discusses specialized white blood cells and antibodies and explains how you can strengthen the immune system. Dr. D agrees to meet the detectives at the Grossology Exhibit at the Virginia Marine Science Museum in Virginia Beach, Virginia. At the exhibit, the detectives learn that even though vomit and mucus are really "gross," they help the body to stay healthy.

Objectives

The students will

- learn how the immune system works to maintain health.
- understand that various body fluids and functions are necessary to maintain health.
- understand the importance of diet, rest, and exercise to maintain a healthy body.

Vocabulary

antibodies— substances produced by the body that combine with an antigen and counteract its effects or those of the microscopic plant or animal on which the antigen occurs

cilia— tiny hairlike cell structures that make lashing movements

immunologist— a person who specializes in immunology

mucus— a slippery sticky substance produced especially by mucous membranes (as of the nose and throat) which it moistens and protects

vaccine— a preparation of killed, weakened, or fully infectious microbes that is given (as by injection) to produce or increase immunity to a particular disease

white blood cells—cells in the immune system that help fight infection

Video Component

Implementation Strategy

The NASA SCI Files™ is designed to enhance and enrich the existing curriculum. Two to three days of class time are suggested for each segment to fully use video, resources, activities, and web site.

Before Viewing

1. Prior to viewing Segment 3 of *The Case of the Biological Biosphere*, discuss the previous segment to review the problem and what the tree house detectives have learned thus far. Download a copy of the Problem Board from the tree house section of the NASA SCI Files™ web site and have students use it to sort the information learned so far.
2. Review the list of questions and issues that the students created prior to viewing Segment 2 and determine which, if any, were answered in the video or in the students' own research.
3. Revise and correct any misconceptions that may have been dispelled during Segment 2. Use tools located on the web, as was previously mentioned in Segment 1.

4. Focus Questions—Print the questions from the web site ahead of time for students to copy into their science journals. Encourage students to take notes during the program to answer the questions. An icon will appear when the answer is near.

5. What's Up? Questions—Questions at the end of the segment help students predict what actions the tree house detectives should take next in the investigation process and how the information learned will affect the case. These questions can be printed from the web site ahead of time for students to copy into their science journals.

View Segment 3 of the Video

For optimal educational benefit, view *The Case of the Biological Biosphere* in 15-minute segments and not in its entirety. If you are viewing a taped copy of the program, you may want to stop the video when the Focus Question icon appears to allow students time to answer the question.



After Viewing

1. Have students reflect on the "What's Up?" questions asked at the end of the segment.
2. Discuss the Focus Questions.
3. Have students work in small groups or as a class to discuss and list what new information they have learned about quarantine, disease, bacteria, cells, tissues, organs, body systems, viruses, the immune system, exercise, and how infectious disease is spread. Organize the information, place it on the Problem Board, and determine if any of the students' questions from Segment 2 were answered.
4. Decide what additional information is needed for the tree house detectives to determine if Jacob is on the right track to staying healthy. Have students conduct independent research or provide students with information as needed. Visit the NASA SCI Files™ web site for an additional list of resources for both students and educators.
5. Choose activities from the educator guide and web site to reinforce concepts discussed in the segment. Pinpoint areas in your curriculum that may need to be reinforced and use activities to aid student understanding in those areas.
6. If time did not permit you to begin the web activity at the conclusion of Segments 1 or 2, refer to number 6 under "After Viewing" (p. 15) and begin the Problem-Based Learning (PBL) activity on the NASA SCI Files™ web site. If the web activity was begun, monitor students as they research within their selected roles, review criteria as needed, and encourage the use of the following portions of the online, PBL activity:
 - Research Rack**—books, internet sites, and research tools
 - Problem-Solving Tools**—tools and strategies to help guide the problem-solving process.
 - Dr. D's Lab**—interactive activities and simulations
 - Media Zone**—interviews with experts from this segment
 - Expert's Corner**—listing of Ask-An-Expert sites and biographies of experts featured in the broadcast
7. Have students write in their journals what they have learned from this segment and from their own experimentation and research. If needed, give students specific questions to reflect upon as suggested on the PBL Facilitator Prompting Questions instructional tool found in the educator's area of the web site.
8. Continue to assess the students' learning, as appropriate, by using their journal writings, problem logs, scientific investigation logs, and other tools that can be found on the web site. Visit the Research Rack in the tree house, the online PBL investigation main menu section, "Problem-Solving Tools," and the "Tools" section of the educator's area for more assessment ideas and tools.

Careers

fitness coordinator
immunologist
personal trainer
lab technician
nurse
Red Cross volunteer
blood donor

Resources

Books

Branzei, Sylvia and Jack Kelly: *Grossology and You*. Price Stern Sloan Publishing, 2002, ISBN: 0843177365.

Cobb, Vicki: *Blood and Gore, Like You've Never Seen*. Scholastic Paperbacks, 1998, ISBN: 0590926659.

Dawson, Susan and Susan Norton: *Pyramid Pal—Adventures in Eating*. Griffin Publishing, 2000, ISBN: 1580000703.

Kalbacken, Joan: *The Food Pyramid (True Books, Food & Nutrition)*. Children's Press, 1998, ISBN: 0516263765.

Leedy, Loreen: *The Edible Pyramid: Good Eating Every Day*. Scott Foresman, 1996, ISBN: 0823412334.

Masoff, Joy: *Oh, Yuck: The Encyclopedia of Everything Nasty*. Workman Publishing Company, 2000, ISBN: 0761107711.

Rockwell, Lizzy: *Good Enough to Eat: A Kid's Guide to Food and Nutrition*. Harpercollins Juvenile Books, 1999, ISBN: 0060274344.

Walker, Pam and Elaine Wood: *The Immune System (Understanding the Human Body)*. Lucent Books, 2002, ISBN: 1590181514.

Web Sites

Yucky Gross & Cool Body

Come and explore this web site, play some really gross games, and learn all about those yucky things your body does!

<http://yucky.kids.discovery.com/body/>

Amazing Facts About the Human Body

This web site has over 30 really amazing facts about the human body!

<http://www.faculty.fairfield.edu/fleitas/bodies.html>

The Immune System—An Overview

This web site takes an in-depth look at the immune system and its parts. Great resource for teachers and older students.

<http://www.thebody.com/step/immune.html>

Cells Alive!

Explore this site to learn all you would ever want to know about cell biology, immunology, microbiology, and more. This site also offers great interactive pages on various types of cells and their parts.

<http://www.cellsalive.com/>

Activities and Worksheets

In the Guide	Red, White, and Plasma Create a model of blood and its various components.	42
	You Are What You Eat Learn how to plan a balanced diet for a healthy immune system.	43
	Vomit or Mucus Anyone? Make your own edible vomit and mucus and learn why they are important.	45
	Fitness for Life Learn the meaning of flexibility, stamina, and strength while creating your own fitness routine.	46
	Answer Key	47
On the Web	Tag, You're Sick! Play a game of tag and discover how the immune system protects the body from germs.	
	Where Are the Nutrients? Practice reading and analyzing nutrition labels to learn how to make healthy choices.	
	Don't Sweat the Small Stuff Learn how the skin helps cool the body when it is overheated.	

Red, White, and Plasma

Purpose

To create a model of blood and its various components

Teacher Note

This experiment can be done as a class or in small groups. Report covers and plastic grocery bags may be used for the red and white plastic sheets.

Background

Blood consists of both liquids and solids. However, the solid part of the blood is made from such tiny particles that they cannot be seen without a microscope. Red blood cells, white blood cells, and platelets are the solid particles of blood. The liquid part of the blood is called plasma. Now imagine the head of a pin. About a million red blood cells would fit on top of it!

Materials

sheet of red plastic
sheet of white plastic
brown construction paper
several hole-punches
scissors
water
yellow food coloring
2 small jars with lids

Procedure

1. Using the hole-punch and the appropriate color sheet of plastic or paper, punch 1,000 red holes and 50 brown holes.
2. Use the scissors to cut out 2 white ameba shapes.
3. Place all the holes and the 2 ameba shapes in an empty jar.
4. Fill the second jar with water about one-half full and add 1-2 drops of yellow food coloring.
5. Pour a small amount of the yellow liquid into the jar, with the holes barely covering the cells.
6. In your science journal, draw a picture of your model and explain each component.
7. Conduct research on each part of blood and share your findings with your classmates.

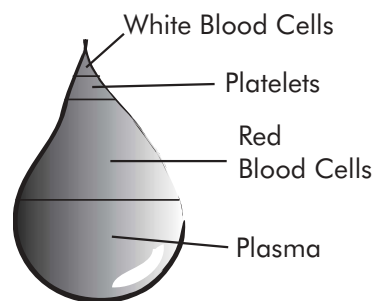


Diagram 1

Conclusion

1. When you poured the yellow liquid into the jar, what did it represent?
2. Why does blood look red when the liquid is yellow?
3. What would happen to your blood if an infection entered your body?
4. Why do you think there are different kinds of cells?
5. Describe the function of each cell.
6. How can Jacob make sure that his blood will keep him healthy?

Extension

Conduct research to discover how the blood flows through the circulatory system. Draw a diagram tracing the flow, being sure to label all the organs.

You Are What You Eat

Purpose

To learn how to plan a balanced diet to strengthen the immune system

Teacher Prep

Either have the students keep track of all they eat throughout a day and record the foods and amounts in their science journals or use "Make It Nutritious" from the NASA SCI Files™ web site <<http://scifiles.larc.nasa.gov>> For a free food calorie counter visit—<<http://www.lhj.com/home/Food-Calorie-Counter.html>>

Materials

daily diet record
science journal
calorie counter books
calculator (optional)

Background

Nutrition is the science that deals with food and how the body uses it. Food gives the body energy to think, function, and grow. It is very important for the body to receive the correct amounts and right types of foods each day so that all the organs and systems can work efficiently and stay healthy. In 1992, the United States Department of Agriculture created a food pyramid that shows the kinds of foods and the number of servings needed each day to keep us healthy. Although many other factors are also considered in making good food choices such as fat, sugar, and salt content, the food pyramid is a good guide to planning a healthy diet.

Procedure

1. Look at your daily diet record to see what you ate the previous day. Use a calorie counter book or internet web sites to determine the number of calories you ate for each meal and snack. Record in the calorie chart below and total the number of calories for the day.
2. Average the number of calories eaten per meal (divided total by three).
3. Total the number of calories eaten by your group and find the average number of calories eaten per person (divide total by number of people in group). Check your diet to determine if your diet was healthy, somewhat healthy, or not healthy at all.
4. In your group, discuss the food pyramid and why it is shaped like a pyramid. Brainstorm reasons why the foods at the top of the pyramid should be limited. Record all answers in your science journal.
5. Use the food pyramid to determine how many servings of each category you ate and record in the category chart.
6. Discuss how you can improve your diet to have a more healthy balance.
7. Plan a menu that reflects a healthier diet.
8. Share your diet choices and menu with the class.

Meal	Calories	Serving Type
Breakfast 1. 2 3.		
Lunch 1. 2 3.		
Dinner 1. 2 3.		
Snacks 1. 2 3.		

Total Calories per day: _____ Average Calories per meal: _____
Total Calories per group: _____ Average Calories per person: _____

You Are What You Eat (continued)

Meal	Bread, Cereal, Rice and Pasta Group	Milk, Yogurt, and Cheese Group	Vegetable Group	Fruit Group	Meat, Poultry, Fish, Dry Beans, and Nuts Group	Fats, Oils, and Sweets
Breakfast						
Lunch						
Dinner						
Snacks						



Extension

Using the menu you created, make a bar graph showing how many items belong to each food group. Some items can represent two groups; for example, a sandwich could be a meat and a grain. Evaluate the menu for nutritional value.

Vomit or Mucus Anyone?

Purpose

To make an edible vomit and mucus

Procedure

VOMIT

1. With adult help, place 1/4 cup of apple sauce into a frying pan and as it begins to heat, add 1 packet of unflavored gelatin and stir.
2. Add 1-2 pinches of cocoa and stir thoroughly.
3. Turn off the heat and sprinkle a small amount of oatmeal into the mixture, but don't stir completely so you will have some "chunky" areas.
4. Repeat with raisin bran.
5. Remove the vomit from the pan and place onto a plate.
6. Spread out the vomit and shape it until it looks real.
7. Stick some raisins or cereal bits for a more realistic look and let it cool for 1-2 hours.
8. Use a spatula to remove the vomit from the plate.

MUCUS

1. Heat 1/2-cup water just until it boils and remove from heat.
2. Pour into a large bowl and add 3 packets of unflavored gelatin.
3. Let the gelatin soften for a few minutes and then stir with a fork.
4. Add enough corn syrup to make 1 cup of thick glop.
5. Stir with a fork and lift out the long strands of gunk.
6. As it cools, add water one spoonful at a time until you achieve the desired consistency for snot.

Conclusion

1. Explain how vomiting helps your body to stay healthy.
2. Explain how snot helps your body to stay healthy.

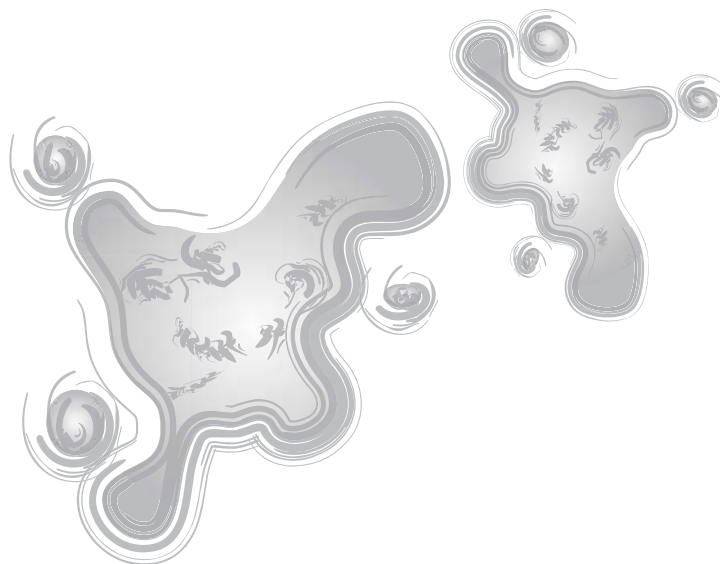
Materials

Vomit

frying pan
spatula
plate
measuring cup
spoon
1 packet of
unflavored gelatin
1/4 cup of apple
sauce
powdered cocoa
oatmeal
raisin bran cereal

Mucus

light corn syrup
3 packets unflavored
gelatin
measuring cup
bowl
stove or microwave
fork



Fitness For Life

Purpose

To develop a fitness plan

Background

Fitness is a combination of flexibility, strength, and stamina. Flexibility is the ability of your body to bend and stretch easily. For your muscles to be flexible, exercise is key. Strength is the amount of weight your muscles can lift. Eating protein and exercising helps strengthen your muscles, which makes you strong. Stamina is your body's ability to endure. You can increase your stamina also by exercising and maintaining a healthy body weight.

Materials

books on fitness
(optional)
construction paper
colored pencils
stapler
science journal

Procedure

1. In your group, brainstorm examples of flexibility, strength, and stamina and record all answers in your science journals. For example a ballerina touching her toes is an example of flexibility.
2. Create 2-3 exercises that would develop the body's flexibility, strength, and stamina.
3. Design and make a booklet with a section for each category listing the exercises you have developed. Illustrate and staple the sides together to bind.
4. Share your exercises with your class, teaching them how to perform each one.
5. As a class, decide which exercises in each category you would like to perform daily to help you and your classmates stay physically fit.
6. Design and create an exercise routine and post it on a chart or poster.

Conclusion

1. Why should you exercise on a daily basis?
2. What are warm-up exercises and why should you do them before any exercise routine?
3. How can exercise benefit Jacob and help keep him healthy?

Extension

Choose ten exercises from the lists created by the students. Have the students copy each exercise on a separate sheet of paper and illustrate. In a large open play area, set up ten stations, placing one exercise sheet at each station. Number the stations 1-10. Divide and number the students into ten groups. Lead the students in warm-up exercises; then, have each group go to its respective numbered station and perform the exercise until you signal. At the signal, the students will rotate to the next station.

Answer Key

Red, White, and Platelets

1. The yellow liquid represented plasma.
2. The blood looks red because there are so many red blood cells it gives blood its color.
3. If an infection entered your body, the white blood cells would begin to multiply to fight the germs.
4. There are different types of cells in your blood to perform different jobs.
5. Answers will vary, but should include that red blood cells are the most numerous, giving blood its identifying color. These cells carry oxygen and carbon dioxide throughout the body. White blood cells act as the body's defense mechanism, fighting against infection. Platelets contain substances that help blood clot to prevent excessive blood loss. The plasma is what helps the cells move throughout the body.
6. There is no positive way to make sure that Jacob stays healthy. However, eating right and getting plenty of rest and exercise can help your body stay healthy, which will help your immune system function properly.

Vomit or Mucus Anyone?

1. Answers will vary but should include that vomiting helps rid the body of harmful substances.
2. Answers will vary but should include that snot acts as a barrier to dirt and germs.

Fitness For Life

1. Answers will vary but should include examples and explanations of how exercising on a daily basis helps maintain good health.
2. Warm-up exercises are those that help you gently stretch your muscles before you begin your exercise routine. It is important to do warm-up exercises so that you do not damage your muscles.
3. Exercise can benefit Jacob just like everyone else; it will help him maintain a healthy body so that his body can fight off disease and infection when it needs to.